(Commemorative Stamp to be released August 26, 1959 · See pg. 3)

AUGUST 1959

# SOIL CONSERVATION

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# SOIL CONSERVATION

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

## ★ THIS MONTH ★

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, June 26, 1958. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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**FRONT COVER.**—A black and white photograph of the new 4-cent soil conservation commemorative postage stamp is shown on the cover. The stamp will be formally released at the annual meeting of the Soil Conservation Society of America at Rapid City, S. Dak., on August 26, 1959. It will go on sale the following day at post offices throughout the country. The stamp will be printed in three colors, yellow, green, and blue.

Issuance of the stamp is a tribute to farmers and ranchers who have put to use such soil and water conservation measures as those shown in the stamp design —terracing, stripcropping, pasture improvement, pond construction, and tree planting.

It is a tribute to the Nation's soil conservation districts. It is a salute to the State and Federal scientists and technicians who have carried on research, developed better ways of protecting the land, and helped landowners carry out conservation plans. It is an expression of gratitude to other conservation programs, such as education, credit, and cost-sharing, which have helped farmers and ranchers install conservation improvements more rapidly.

The silhouette of a city in the background is a reminder that care of the land, our primary source of food, shelter, clothing, and wildlife, is important to urban as well as rural people.

**All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.**

# The Soil Conservation Postage Stamp

MANY commemorative postage stamps are issued to observe the anniversary of a noteworthy historic event or to honor a long-dead national hero. The world's first soil conservation stamp, to be released on August 26, 1959, at Rapid City, S. Dak., celebrates no anniversary and honors no man.

Its issuance is, rather, a recognition that American farmers and ranchers, and their government, are hard at work to protect and improve our most valuable natural resource, the soil.

The Post Office Department issues about 12 commemorative postage stamps each year. That is about as many as the Bureau of Engraving and Printing can print satisfactorily; it is about as many as the Department's distribution system around the country can absorb; and it is about as many as most philatelists believe should be printed.

Requests for commemorative stamps originate with individuals and organizations from all parts of the Nation and are made by letters sent directly to the Postmaster General. No legislative action is necessary. (The Department has a backlog of requests for commemorative stamps of approximately 3,000 and receives from 250 to 300 new requests each year.)

The stamps suggested must meet the criteria established for the selection of United States commemorative postage stamps, and are then referred to the Citizens' Stamp Advisory Committee.

The Committee is made up of three of the most outstanding philatelic authorities; three nationally known artists and designers; and a representative of the United States Information Agency with three ex officio members.

After careful review of requests, the Citizen's Stamp Advisory Committee recommends a commemorative stamp program. When the program is approved by the Postmaster General, the artist members of the Committee are responsible for the designs of the selected commemorative stamps.

These designs are subject to the approval of the entire Citizens' Stamp Advisory Committee before recommendation to the Postmaster General, who makes the final determination.

The completed artwork is then turned over to the Bureau of Engraving and Printing for preparation of the model and color proof, which is submitted to the Post Office Department for the Postmaster General's approval. The dies are then engraved and the stamps are printed and distributed.

For each commemorative postage stamp, a site is chosen for the First-day sale dedication ceremony. On that day the stamp is available only in the designated city. The next working day, the stamp is on sale in the 36,000 post offices in the United States.

The Philatelic Sales Agency of the Post Office Department in Washington sells over $2 million worth of stamps each year, and local post offices sell stamps to the approximately 20 million stamp collectors in this country. Estimates made by the Department indicate that total philatelic sales amount to between $20 and $25 million a year. These stamps, sold to collectors, are not used for postage and the Government is not called upon to perform any service, so that the sale of stamps for philatelic purposes is a profitable operation for the Post Office Department.

Observances are planned for the soil conservation stamp in most of the Nation's 2,840 soil conservation districts in cooperation with various agricultural, industrial, civic, and conservation groups.

First-day "covers" containing the stamp are available through the Postmaster at Rapid City, S. Dak. Upon request and receipt of addressed envelopes and a remittance to cover the cost of the stamps, the post office at Rapid City will place the new stamp on the envelopes, cancel them with a special cancellation mark used only on that day and at that place, and mail the envelopes on the first day of issue.

# *Rural Development Begins With The Soil*

By GLADWIN E. YOUNG

SOIL and water conservation is proving to be an essential tool in helping underdeveloped agricultural areas of the country to a better balanced economy and a better living for low-income rural families cooperating in the Rural Development Program.

Proper use of land, and the water that nourishes it, is the real base upon which rests the economy of approximately 200 county areas in which this local-State-Federal rural improvement undertaking is moving ahead. That is true whether the soil has been pretty well "farmed out" through years of use or neglect or was not too productive to begin with.

Starting with this premise, local leaders, with cooperation of State and U. S. Department of Agriculture research, extension, technical, and cost-sharing and credit agencies, have literally built the Rural Development Program from the ground up. This special assistance is provided through regular programs of the Department, with coordination and leadership of state and county committees, and cooperation of other Federal agencies.

Note:—The author is Deputy Adminstrator, Soil Conservation Service, Washington, D. C.

Floyd F. Taylor (left), a cooperator in the Monroe County, Ohio, Rural Development Program, discusses the soil map of his farm with SCS soil scientist.

One of the first steps in a rural development area, after economic and related studies confirm its need for the kind of self-help support provided through this program, is that of providing soil survey information. The soil maps comprise an inventory of the land resources that is all-important in appraising the agricultural potentialities both of individual farms and communities in relation to the industrial or other off-farm opportunities.

Where generalized soil maps already have been made of rural development counties, the Soil Conservation Service makes them available to the local committees. These maps set out the basic soil resources of the county in such a way as to suggest the potentials for communities, watersheds, or other subdivisions in the counties. The maps may also be used in zoning or other planning. The Service helps in interpreting the general soil maps to indicate the problems and most likely opportunities for existing and proposed agricultural undertakings.

The Service similarly provides basic information from soil surveys already made on individual farms, and makes new surveys, within the limits of available facilities for doing so. The resulting soil and land capability maps show the lands that are best suited—or least suited—for row and grain crops, pasture and hay, woodland or wildlife use.

The basic objective in making a farm soil map for the Rural Development Program is to appraise the farmer's opportunities on the farm as compared with what they might be in some other occupation. This evaluation, in turn, is keyed in with the general goal of developing

the county's or trade area's full potential for agriculture and for supplemental industries. The aim is for overall economic improvement by the people within the area, without the need for them to seek such opportunities outside the community.

Some of the developments stemming from the use of county or trade-area soil maps have included: The initiation of small-watershed protection and flood-prevention projects, roadside erosion control, designation of land areas best suited for wildlife and recreational purposes, selection of sites for local industries, and overall determination of lands best suited for various purposes in countywide or trade-area planning.

Soil mapping and conservation farm planning both have been speeded up in most rural development areas. In some cases, progressive soil surveys are made in advance in parts of counties where a substantial number of farmers come within the special category served by the Rural Development Program. These soil maps are used in the conventional manner for farm and ranch planning, with necessary supplemental interpretations on costs and benefits of special crops and practices needed in adjustments.

Similarly with conservation farm planning, the end rural development objective of bringing about maximum use of soil and water resources on a sustained basis is given specific attention by SCS technicians. They also help the farmers apply needed land-use and water-management conservation measures.

For the fiscal year 1959, 67 counties were allocated special funds for SCS assistance. These allocations were on the basis of an estimated 100 man-years of special technical aid in certain rural development counties in 30 States and Puerto Rico. The year before, about 71 man-years of such special technical aid was provided by the SCS.

A review of the latest available (1958 fiscal year) county rural development reports shows how the soil surveys and the conservation farm planning and technical aid consistently are contributing to overall advancement of the program.

Take, for example, Perry County, Ind., where the program is no longer considered a strictly "pilot" program, because it already had spread to nearby Crawford and Harrison Counties in 1958. The Soil Conservation Service provided 1½ man-years of soil survey and conservation farm planning help in Perry County. Soil maps

An abandoned farm that was bought by Franz Carpenter as an addition to his farm as part of the Rural Development Program in Monroe County, Ohio.

**Roadside sign of Reedyville community, Butler County, Ky.**

were furnished on 6,000 acres, and conservation surveys on 8,000 acres were converted to standard surveys.

Conservation measures were applied on 48 farms, with 24 basic conservation plans established on such farms; and 23 Rural Development Program farmers became cooperators with the Perry County Soil Conservation District. Also, local community interest in a watershed protection and flood prevention project on the 67,000-acre Middlefork Creek watershed resulted in its approval for planning early in 1959.

**Soil conservationist discusses a conservation plan with Carl Gayer of Troy, Ind., who is a cooperator in the Rural Development Program.**

Illinois' rural development area in Alexander and Pulaski Counties provides a concrete illustration of the practical results of combining basic land-use planning with other available improvement facilities. Forty basic conservation farm plans, on approximately 2,750 acres, and about 25,775 acres for which land capability maps had been completed were reported for this two-county area.

The Farmers Home Administration refinanced one farmer, for example, by advancing him capital to buy 40 acres of adjoining land to make his farm an economical unit; to build a pole barn; to apply needed basic land treatment as shown by the soils information; and to improve his herd of beef cattle. Local banks also were considering expanding their financial assistance to low-income farm families.

The broader watershed approach to land and water problems in rural development areas is being given increased attention—as it is throughout the country. Thus, in Tippah County, Miss., the County Rural Development Committee was active in development of the Muddy Creek and the West Hatchie watershed projects. A reduction of about 90 percent in flood damages will result from the planned conservation land treatment and floodwater retarding dams and stream channel improvement. A full-time SCS technician was assigned to Tippah County, one of four rural development counties in Mississippi.

In Alabama's Chilton County, additional technical help was made available to 62 rural development cooperators during the year, with 35 new basic conservation farm plans developed and another half-dozen plans revised; and, soil mapping was stepped up on small, part-time farms. In Fayette County, the Langston-Dodson Creek watershed plan in the area is about completed.

And in South Carolina, SCS technicians in Bamberg County have concentrated their efforts on helping farmers develop conservation farm plans on *all* small farms in that rural development area since the program's start there in the fall of 1956. They reported 66 such plans on small farms.

In Berkeley County, S.C., in addition to individual and area-wide farm soil surveys, improvement work included two group drainage projects with special Agricultural Conservation Program cost-sharing; special effort has been given to forest management and to conservation reserve cost-sharing; and Farmers Home Administration loans have been made to help the Rural Development Program cooperators.

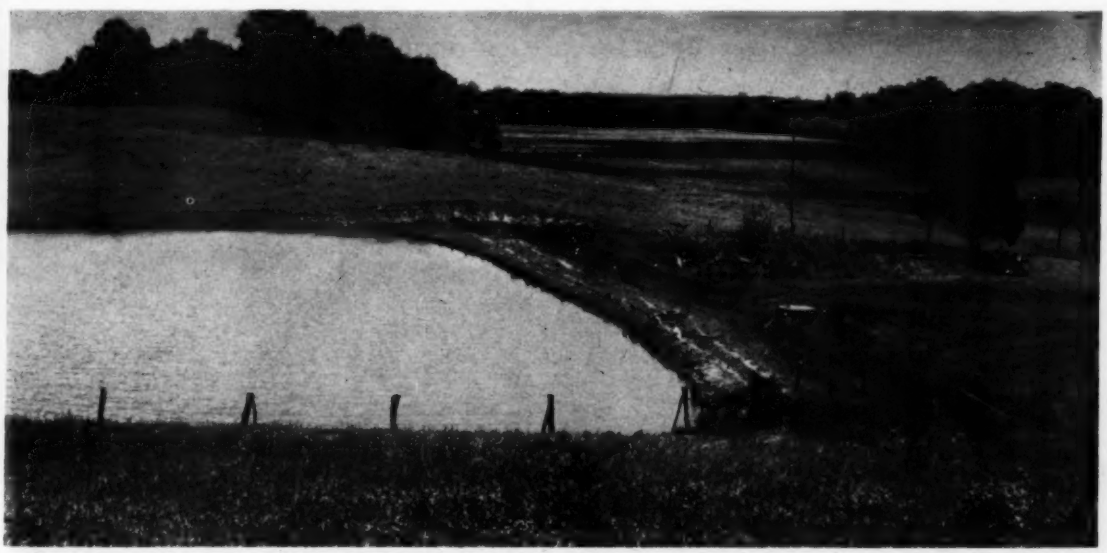
In North Carolina's Bertie County, added SCS help was given on drainage and irrigation and in selecting fields for growing crops for a new produce market in this area. A farm forestry program, meanwhile, was being planned; and Bertie County interests joined with those of Northampton and Hertford Counties in seeking to start a small-watershed project.

Statewide, Tennessee reported 65,000 acres of soil mapping in rural development areas in five counties; 1,195 acres reforested; watershed project possibilities investigated in four counties; and approximately 400 farmers helped with their soil and water conservation problems. Also, soil and water conservation loans through the Farmers Home Administration were contributing to the program.

A 1959 Department of Agriculture superior service award to Tennessee State Conservationist Joseph R. Sasser of the Soil Conservation Service was based in part on his interest in low-income farmers that "has resulted in more opportunities for better living through Rural Development Programs in five counties." The nomination pointed out that one RDP county increased strawberry yields through special land selection and on-site technical assistance and that another, with ACP aid, planted 450,000 trees during the past 2 years.

Water conservation understandably figures predominently in Rural Development Committee reports from the West. In Washington's Stevens County, for example, interest centered in better drainage facilities in the low-income farm areas of the Colville Valley and in watershed projects. Fifty-five farmers along 18 miles of the Colville River organized the Chewelah Flood Control Association; and watershed project applications for Chewelah Creek and the Little Pend Oreille River received State approval in 1958, as had an application for a project on Mill Creek earlier.

In Bernalillo County, N. Mex.,—one of 9 counties in the rural development area in that State—major attention was given to water conservation and land-use measures, with special subcommittees working on problems of proper water usage, moisture requirements for crops, and better irrigation practices.



**Farm pond with stock watering tank constructed on the J. F. Annis & Sons farm as part of the Rural Development Program in Butler County, Ky.**

Land-use adjustments needed on dryland farms also are high on the list, with more participation urged in the Conservation Reserve Program to enable more families to take advantage of off-the-farm employment and increase their income. An additional 1,300 acres on the eastern side of the county in the dryland farming area was reported seeded to native grasses through the Soil Bank Program in 1958.

In these and the other states and counties over the country in which the Rural Development Program is spreading, the SCS is continuing to accelerate its soil survey, conservation planning, and help in applying soil and water conservation practices. It does so through working agreements with the state and county Rural Development Committees, if the committees believe there is need for this special technical help.

Rural development objectives are being realized, also, through community watershed and other undertakings outside of designated Rural Development Program areas. The Six Mile Creek "pilot" watershed project near Booneville, Ark., is one example. More than half the farmers in this 165,000-acre tributary watershed to the Arkansas River were found to be part-time farmers, with some 300 having less than $500 a year from farm income.

The watershed project has proved its worth in various ways. By 1956, 21 completed flood prevention reservoirs made available several hundred million gallons of water in that critically dry year. Availability of extra water storage in two of the reservoirs alone contributed to the decision of a comb company to locate a plant there, with a $500,000 annual payroll for 200 employees drawn principally from surrounding farm areas. Meanwhile, farmers below the dams are able to develop water for irrigation; and the flood retention reservoirs hold back excess water at flood times.

Working closely with soil conservation districts and other local and state interests concerned, the SCS thus is best able to make a practical contribution to more efficient farming and increased income for Rural Development Area farmers everywhere.

# *Modern Homesteading*

By ELDO A. C. BETCKE

HOMESTEADING in the Magic Valley of southern Idaho has been going on for several years on the Minidoka Project of the Bureau of Reclamation, where to date about 800 new farms have been made available to veterans of the Armed Forces.

Unit "A" is a part of this project, and a large portion lies in Jerome County in the North Side Soil Conservation District. Water for irrigation is pumped from the Snake River.

Farmers of this area like to believe this is some of the most productive land in this part of the State and will develop into the finest farms in southern Idaho. The soil is deep, medium-textured, and easy to farm; but, is low

Typical scene of sagebrush on homesteaders land in Magic Valley at time of settlement.

Note:—The author is soil conservationist, Soil Conservation Service, Hazelton, Idaho.

Sagebrush crowner used for undercutting brush prior to clearing and leveling.

in organic matter after the brush is removed.

Homesteading has been a new experience for the families coming here from all over the United States. Most of them have had to dig deep and make sacrifices to take advantage of the opportunity offered them in the development of these new farms.

The Bureau of Reclamation made topographic surveys of the entire area to locate farm boundaries, canals, and laterals, which enabled them to deliver water to the high point of each farm. The majority of the farms are not divided by straight lines, but by drainage ways and high areas on which the canals or laterals are located. Most of the farms have only one headgate, through which the irrigation water for the farm is delivered. Boundaries were laid out so that each farm would have approximately 100 acres of irrigable land.

Drawings for these farms were held at Rupert, Idaho each year for the number of farms that could be made available. Veterans of the Armed Forces with the required amount of farming experience and financial resources, filled out applications and mailed them to the Bureau of Reclamation at Rupert. The name of each eligible applicant was placed in a capsule. Capsules then were drawn to determine the sequence in which each man would select his farm. The entrymen were given ample opportunity for field inspection of the farms so they could make a selection when their turn came.

It was quite simple up to this point, but from here on the new homesteader was on his own in developing his farm. A big problem that homesteaders had to solve was to find a place to live, either in town or on their new unit, while they were making a start. Many trailer houses and even some tents could be seen on these farms in the spring of 1957.

The first step in the new venture was clearing the land; then came the building site selection, land leveling, field layout, ditch construction, and planting of crops. To many of the homesteaders, irrigation was a new experience and new farming methods had to be learned.

Tractor drawn carryall moving dirt on a land leveling job in Magic Valley.

It was apparent from the start that those who came to homestead these units were willing to make the necessary sacrifices and to put in long days of hard work to make a success of their new venture. Clearing the land of brush opened it to the full force of southern Idaho winds, and housekeeping in those days was an endless task for the housewife as the fine particles of dust penetrated everywhere.

Financing the new venture seemed to be the biggest obstacle for most of these families. Clearing and leveling the land was not the back-breaking work of pick and shovel and horse-drawn scraper of 50 years ago, but required a considerable outlay of cash to hire modern clearing and leveling equipment. Many of the neighbors exchanged the use of farm machinery in order to cut down on individual expense for the equipment needed on each farm. The average investment in one of these farms is $18,000 to $27,000.

Sixty-two of these farms are located in the North Side district, and in the last 2 years 43 of the homesteaders have become cooperators with the district. It has been a pleasure to work with the homesteaders who have become cooperators of the district because they are eager to use the services of the Soil Conservation Service in leveling, field and ditch layout, cropping information, and any other help we could give them.

SCS technicians, with the help of the farmers, set up guidelines to assist in staking the units on a 100-foot grid. When the staking was completed, a survey of the entire farm was made and the leveling and ditch-layout plans were made from this survey. Some of the homesteaders did only the most necessary part of the leveling the first year. To reduce duplication of effort, a plan was made from the survey so that the cropping system and later leveling would fit in with the leveling already completed.

Robert Scott with some of his foundation stock for his hog farming project.

John Ottman and family on the front steps of their new home.

Tree plantings for field and farmstead windbreaks were made on two cooperator's farms in 1957 through the combined effort of the North Side district and the Idaho State Fish and Game Department. Both were almost complete failures due to rabbit damage. Another planting, with good survival, was made in the spring of 1958 on 11 of the farms.

It is interesting to learn what some of these men were doing at the time each was notified that he was a lucky winner of one of these farms:

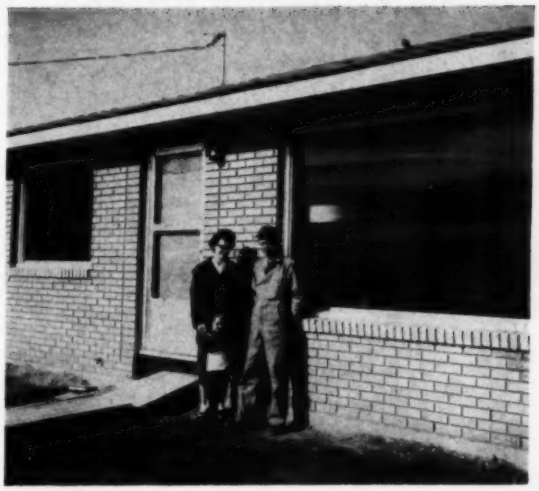
Robert Scott of Carnegie, Okla. was a student at Oklahoma State University, majoring in animal husbandry. He was taking final examinations when his wife brought him word that he now had a farm. They received the news with mixed emotions as it necessitated changes in their plans for the future. Bob was widely known for his hog raising project which began when he was an FFA boy in high school. He had exihibited animals at many of the large state fairs and livestock shows and has received offers of jobs from several of the large meatpacking companies. The Scotts are well established on their new farm now, and Bob is back in the hog raising business.

John Ottman was operating a 185-acre irrigated farm at Grand Junction, Colo., on which he was putting up hay when he received a letter notifying him that his name had been drawn for a farm unit. Ottman and his wife immediately made a trip to this area to look over the farms and were anxious to make the change after seeing the country. Their first home was a rented trailer house in which they lived until their new home was completed. His crops have been beets, potatoes, grain, hay, and beans. He has not definitely decided on a livestock venture, but he says it will be either sheep or cattle.

Steve Goodwin and family and their new home.

Steve Goodwin was operating a rented 160-acre farm near Carnegie, Okla. prior to coming to Idaho. At the time he received his letter saying his name had been drawn, he was selling cars in Dallas, Tex., after crops had been harvested. Mother Nature was very skimpy on rainfall in that area and crops had not been very good. The Goodwins were ready to make the change because it looked like a real opportunity to get ahead. Steve is still undecided on livestock, but thinks he will feed some cattle.

Leonard Mills was a Nebraska boy who had transplanted himself to Santa Barbara, Calif., where he was in the refrigeration and air conditioning business. He was at Rupert when his name was drawn at the official ceremony. It was a happy occasion for them, especially for Mrs. Mills, as her parents live at Twin Falls, Idaho. Leonard's crops have been beans, potatoes, peas, and grain. He is planning to go into hog production as a livestock venture.



Leonard Mills and family in front of their new home.

Dave Anderst was employed by a construction company at Idaho Falls, Idaho when he received his notice. He made a dash around the trailer court, barefooted, telling the good news to everyone. Dave's farming experience had all been on dryland in North Dakota, so irrigation was a new experience for him. He has already made some extensive tree plantings on his unit through the cooperation of the North Side district and the Idaho State Fish and Game Department, and is planning to make more each year for several years.

Dave Anderst and wife beside some of the first trees planted on their homestead.

# CONSERVATION RESEARCH IN THE LOWER RIO GRANDE VALLEY

By J. R. JOHNSTON

**No. 48**

**This is the forty-eighth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.**

ON October 27, 1958, B. T. Shaw, administrator of the Agricultural Research Service, gave the dedication address for the new USDA Citrus, Vegetable, Soil and Water Research Laboratory at Weslaco, Tex. Shaw stated that this research facility would permit more productive research on the problems of soil and water conservation, and on problems confronting citrus and vegetable growers in this area.

The new laboratory is located on 3 acres of land at Substation No. 15 of the Texas Agricultural Experiment Station and deeded to the U. S. Department of Agriculture. The completion of this laboratory provides strengthened opportunities for cooperative research on soil and water conservation problems in the Lower Rio Grande Valley and similar areas in southwestern United States.

The three soil conservation districts in the

Note:—The author is area director for the Texas-Oklahoma-New Mexico-Kansas-Colorado area, soil and water conservation research division, Agricultural Research Service, Fort Collins, Colo.

**The new citrus, vegetable, and soil and water conservation laboratory at Weslaco, Tex.**

Lower Rio Grande Valley purchased a 50-acre block of land, 3 miles north of Weslaco, for the soil and water management phases of the new work. This soil and water research farm is operated under a Memorandum of Understanding between the soil conservation districts, the Texas Agricultural Experiment Station, and the Agricultural Research Service.

There are approximately 1,500,000 acres of cropland in the Lower Rio Grande Valley. About 700,000 acres are irrigated with the remaining 800,000 acres in dryland agriculture. The average annual rainfall varies from 18 to 26 inches per year from the western part of the valley to the coast.

Up to 1954, there was no water storage reservoir on the Lower Rio Grande River. In 1954, Falcon Dam and Reservoir were completed by the United States and Mexico. This reservoir has a total capacity of 4,085,000 acre-feet with 2,100,000 acre-feet of conservation storage, with 58.6 percent being allocated to the United States. This storage in Falcon Reservoir has firmed up the irrigation water supply for the valley in a major way.

During a joint Federal-State–soil conservation district research planning conference in August 1957, it was determined that the following soil and water problems were pressing ones insofar as irrigated agriculture in the Lower Rio Grande Valley was concerned: (1) Poor soil structure; (2) Inefficient irrigation water management; (3) Timing of water application in relation to the physiological development and condition of plants; (4) Correct use of fertilizer in relation to a varying irrigation water supply; (5) Loss of productive land due to salting out; (6) Problems of poor quality irrigation water; (7) Poor soil conditions for good plant root development and activity; and, (8) Soil compaction resulting from use of heavy farm machinery.

These listed problems along with state and regional Soil Conservation Service research needs statements have served as guidelines in developing the new research work in the Lower Rio Grande Valley.

When conservationists consider long-range stability and productivity of valley agriculture they conclude that: (1) the 1,500,000 acres of cropland is a nonrenewable resource, and (2) the surface water resource is subject to renewal

Aerial view of alkali spots on dryland farms in the Lower Rio Grande Valley.

on an annual basis. These maxims have been given due consideration in formulating the new soil and water research in the Lower Rio Grande Valley. It is recognized that on an annual basis the efficient use of irrigation water and rainfall for crop growth is of utmost importance. It is also recognized that on a long-time basis the prevention of saline and alkali soil conditions and the maintenance of soil productivity is imperative if valley agricluture is to remain productive.

Soil salinity (hot spots) cause an uneven stand of tomatoes on a dryland farm of the Lower Rio Grande Valley.

This expanded soil and water conservation research program in the Lower Rio Grande Valley has permitted strengthening of work on: (1) drainage and salinity control on both irrigated and nonirrigated lands, (2) soil structure improvement in relation to more efficient use of limited irrigation water, (3) irrigation water management in relation to stage of crop growth, and (4) improved fertility of soils in relation to sustained soil productivity and efficient use of water.

The ARS now has three engineers and four soil scientists along with supporting help at the new Weslaco laboratory. This staff, working closely with scientists in the Texas Agricultural Experiment Station, will be able to develop new knowledge on soil and water conservation problems occurring in the Lower Rio Grande Valley and similar areas in the Western United States.

The seed for this expanded soil and water research was planted in 1937, when the Texas Legislature enacted the State Soil Conservation Law authorizing the organization of soil conservation districts as political subdivisions of Texas. Since that time the people in the Lower Rio Grande Valley have continued to develop their conservation program. The new research laboratory is a part of the progress of the valley conservation program.

In 1949, the Soil Conservation Service initiated a limited research program on irrigation water management in cooperation with the Texas Agricultural Experiment Station and soil conservation district cooperators. This research was very helpful in further development and refinement of level irrigation. Land leveling for irrigation water management became a major conservation practice in the valley in 1951-52. Since 1951, 165,000 of the 700,000 acres of irrigated land in the area have been leveled.

In 1953, the research division of the SCS was transferred to the ARS. In April 1955, during a soil and water conservation research review in the Lower Rio Grande Valley, soil conservation district supervisors requested ARS to strengthen soil and water research in the area. The soil conservation districts and other valley interests worked diligently for more soil and water research. The combined efforts of these groups and those concerned with citrus and vegetables resulted in the new laboratory and in increased funds for soil, water, citrus, and vegetable research.

**Cotton preplant irrigation on water management plots on research farm at Weslaco.**

# Hydrology in Soil and Water Conservation

By R. G. ANDREWS

**This is the fourth and fifth of a series of articles that attempt to explain, in nontechnical terms, the duties, responsibilities, and methods of Service hydrologists.**

## Why a Hydrologist Computes Backwater Curves

FLOODS are caused by a combination of two conditions—high rates of runoff and low stream and river channel capacity. River channels, if undisturbed by man, naturally develop a capacity sufficient to contain the storm runoff that can be expected to occur on the average no more frequently than once in 2 years. This figure is significant because it means that on the average, rivers and major tributaries left in their natural state will overflow their banks 50 times in 100 years. The activities of man generally increase the rate and amount of surface runoff and decrease the capacity of natural channels to the extent that the frequency and severity of flooding are increased.

The evaluation of a flood prevention program begins with the determination of the capacity of the channels in a watershed. This requires that the location of cross sections be selected so that the hydraulic characteristics of a channel and flood plain are adequately represented by them. A field crew surveys the cross sections at the selected locations and plots the results of the surveys on plotting paper ruled in a grid appropriate for the purpose. With these data and a meter to measure the velocity (speed) of the flowing water, a hydrologist could determine quite accurately the capacity of the channel at each cross section. This procedure would require 5 to 10 years of observations. Fortunately, there is a less time-consuming method of making the determination.

In 1889, an Irish engineer named Robert Manning presented a paper to the Institute of Civil Engineers of Ireland that contained a formula for computing the velocity of flow in open channels and pipes. The formula was subsequently modified into its present form, but still carries Manning's name. The formula is almost universally used, or misused, by engineers to compute the velocity of flowing water in open channels.

There is a symbol in the formula that represents the slope of a line (energy gradient) computed from the total energy of the water at various points along the stream. This fact is often ignored in the solution of flow problems and the slope of the water surface or of the channel bed used. The direct substitution of the measurable water surface or channel bed slope in the formula, except for special conditions of flow, leads to erroneous answers.

Water flowing in a channel gains kinetic energy (the energy of motion) as it progresses from a high elevation to a lower one; it also looses energy due to the internal friction of crosscurrents caused by the channel alignment, roughness of the sides and bottom, and obstructing debris. When the energy gained is exactly balanced by the energy lost, the flow is said to be uniform. For this condition the results obtained in the solution of Manning's formula by the direct substitution of measurable units will be as accurate as the estimate of the rough-

Note:—The author is head, central technical unit, Soil Conservation Service, Beltsville, Md.

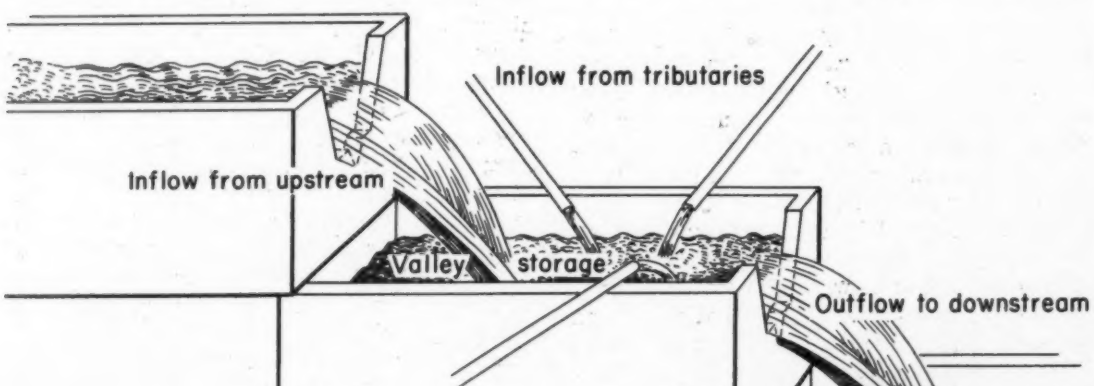
ness of the channel. Uniform flow is a rarity in natural or dredged channels. Therefore, it becomes necessary first to make computations to determine if it exists. If it is found that uniform flow does not exist and Manning's formula is not applicable, one must resort to other methods of computing channel capacities.

Daniel Bernoulli, in his "Hydrodynamica," published in 1738, introduced the analytical basis for what came to be called Bernoulli's theorem of the conservation of energy. This theorem states that the total energy contained by a stream of water at an upstream point is equal to the total energy at a downstream point, provided there is no loss of energy due to friction or work and no outside energy is added. By combining Bernoulli's theorem with Manning's equation for uniform flow, it is possible to derive an equation for the solution of channel flow problems when the flow is not uniform. Paul D. Doubt derived such an equation by re-evaluating and extending the work of Francis F. Escoffier. An algebraic solution of the equation requires trial and error computations which are much too laborious for practical application. Doubt's graphical solution requires that the total energy for various depths of flow at a cross section be related to the total energy at the next upstream cross section. This relationship is graphically represented by a diagram known as backwater curves. The capacity of dredged channels, or natural channels and valleys, is computed rapidly and precisely by the application of the graphical procedure once the backwater curves have been computed.

Thus the computation of backwater curves is the only method whereby a relationship between the rate of flow and depth of flow in dredged and natural stream channels can be computed with sufficient accuracy, in the majority of watersheds, to develop a firm estimate of the average number of acres that are flooded annually.

## *Why A Hydrologist Routes Floods*

THE proper evaluation of a flood prevention program depends upon computing the number of acres of flood plain that are




**Flood routing computes the balance of inflow, outflow, and storage in a valley.**

flooded annually. This estimate depends upon the volume of runoff and the capacity of the stream channels and valleys. The prediction of rate of flow at a specific hour at any point in a stream system is accomplished by a procedure known as flood routing. The rate of flow is defined as the volume of water (usually cubic feet) that will pass the point in a unit of time (usually a second).

Flood routings are performed to: (1) predict the behavior of a stream during periods when the tributaries are discharging different quantities; (2) predict the behavior of a stream at any desired point; and, (3) predict the behavior of a stream after changes in channel conditions.

As previously explained, an SCS hydrologist computes backwater curves to develop a relationship between the rate of flow in a stream and the depth of flow at the cross section locations. This relationship is known as a section rating curve. The maximum depth of flow at each cross section for storms that occurred in the past is needed to compute the area of flood plain that was inundated. The maximum rate of flow at each cross section is computed by routing the storm runoff through the storage of the stream channel and valley system. The depth of flooding is obtained by applying the maximum rate of flow to the section rating curves.

In theory, flood routing is an accounting system as simple as balancing a checking account at a bank. There is a computed volume of inflow during a time interval (bank deposits), outflow during the same time interval (withdrawals), and water left in the system at the end of the time interval (bank balance). In actual practice, the accounting system becomes so complicated that a simple satisfactory approach has yet to be devised.

To continue the analogy, the bank deposits vary from minute to minute from each source (tributary); the rate of withdrawals also varies from minute to minute and is directly dependent upon the bank balance which is, in turn, dependent upon the relative rates of deposit and withdrawal. The withdrawals are not spent, but become deposits in the next downstream bank, which is also receiving deposits from tributary banks. The problem becomes one of computing the rate of inflow, rate of outflow, and storage at specific instants for any one of numerous streams between two cross sections.

Thus by flood routing the hydrologist computes the past behavior of the stream and predicts the future behavior after the installation of a flood prevention program.

# GREAT PLAINS CONSERVATION PLAN IN NESS COUNTY

By WILLIAM B. SORENSEN
and ORVAL A. HAROLD

ARTHUR PEMBER is the first Ness County, Kans., farmer to develop a complete conservation plan for his farm under the recently established Great Plains Conservation Program.

The objective of the Great Plains Conservation Program is to stabilize agriculture through a complete soil and water conservation program. The farmer or rancher and the Soil Conservation Service develop a plan of operation, which includes all of the conservation practices to be applied during the contract period. When this plan is completed to the satisfaction of both parties, the farmer and the Department of Agriculture enter into a contract. In effect, the contract is an agreement by the farmer that he will perform these conservation practices as scheduled, and that the Government will set aside the needed cost-share funds for the farmer to earn at the time he applies the practices to his land.

Arthur Pember farms in partnership with his father, I. A. Pember, of Ness City, who owns a 1,920-acre grain and livestock farm in the southwest part of Ness County. Mr. Pember has been interested in soil and water conservation for several years. Because his cropland had considerable sheet and gully erosion, he terraced 160 acres a few years ago. By building the ter-

Note:—The authors are, respectively, work unit conservationist, Ness City, Kans., and Great Plains conservation specialist, Dodge City, Kans., both of the Soil Conservation Service.



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races, farming on the contour, and keeping as much crop residue on the surface as possible, he has reduced soil erosion to a minimum.

Pember is also interested in managing his grassland correctly. He found that to attain an even distribution of grazing, he needed additional stock water. With the assistance of his soil conservation district, the Soil Conservation Service, and the Agricultural Conservation Program he constructed two stock water ponds in the areas not being grazed as much as other areas.

More recently, Pember terraced two additional fields and part of another. During 1958, he shaped a waterway and seeded it to grass. Now, as in the past, his 906 acres of pasture are being consistently grazed with good management. However, much remained to be done on the farm before he could feel confident that it would be well protected from wind and water erosion.

Pember recognized the need for additional conservation treatment. The Great Plains Conservation Program afforded an opportunity to complete the program that he started earlier. The first step in developing the new plan was to review what had been accomplished and decide what was yet needed.

After studying the soil survey map of the land, he made a list of all the conservation practices needed. These practices when applied should give his land proper use and complete treatment for soil and water conservation. The

Arthur Pember (left) and William B. Sorensen in a draw that is to be made a grassed waterway on the Pember farm.

Pember stands near the center of one of the damsites for ponds to be constructed on his farm.

local Soil Conservation Service technicians assisted Mr. Pember by giving him information that would help him decide what he needed and wanted for his farm.

Mr. Pember decided that for the cropland he would need more terraces and several waterways to carry away the excess water from the terraces. Also, to keep more of the water on the land where it fell, he planned to establish a good system of crop residue management and contour farming. Not wanting to neglect his rangeland, he developed a long-time range management plan after getting information from an SCS range conservationist. He included in his plan proper range use, distribution of watering places with stock water dams, and some windbreak plantings for livestock shelter.

As the list was rather long, it was obvious, considering time and money, that it would be impossible to accomplish everything in 1 year. The next step was to decide in what order and in what length of time his plan could be completed. The Great Plains Conservation Program is designed for a 3- to 10-year period. Pember figured that with the planning and help he could expect from the SCS, he could complete his plan within 3 years.

To help in determining what projects he would do first, SCS technicians helped develop

a conservation map from an aerial photograph of his farm. On this map the fields were numbered so that the sequence of conservation work to be done could readily be seen. After considering the cropping and grazing sequences now in use, the following timetable was set up: In 1959, Pember plans to construct 2 grassed waterways occupying 17 acres, build 2 miles of terraces, plant 1 acre of windbreaks. In addition, he plans to practice contour farming and crop residue management on his 953 cultivated acres and proper range use on his 906 acres of rangeland.

In 1960 he plans to construct an additional 6 miles of terraces and build a stock water dam, while continuing all established practices. In 1961, he plans to construct an additional 13 miles of terraces and build another stock water dam.

As a result of the agreement with the Federal Government, Mr. Pember knows, for example, that money has been set aside in 1961 for cost-sharing on the construction of the stock water dam he has planned for that year, along with other practices on which cost sharing is approved. If adverse weather conditions should prevail or circumstances develop that cannot be controlled, causing the planned sequences to be changed, there are provisions whereby the contract can be modified.

When all practices of the conservation plan of operations have been applied to the land, assuming that prices remain the same during the contract period, the Government will have provided $4,933.17 in cost-sharing. This will represent approximately 75 percent of the total cash cost of applying the conservation practices. Pember will make up his share with labor and an agreement to carry out a complete conservation program.

Upon completion of his plan of operations on December 31, 1961, Arthur Pember's land will be in top condition as far as soil and water conservation is concerned. By continuing with the maintenance of the applied conservation practices, he will have a sound program for years to come.

Mr. Pember commented, "I realize that to maintain my farm's productivity it will be necessary for me to have a complete conservation plan. The Great Plains Conservation Program gives me an opportunity to do this."

# *LITTLE WOMAN IN A BIG JOB*

By JACK PUTMAN

A 5-foot, 2-inch, 110-pound farm woman has been elected to a man-sized job as supervisor of the Caney Valley Soil Conservation District—the first woman ever to be named to the post in Oklahoma.

Mrs. Margaret Riney, Bartlesville, led the ticket against five men in the district election last spring—garnering 103 votes, 26 more than the nearest contender, Dick Bennett, her son-in-law.

Officials confirmed the vote count which put Mrs. Riney in, along with Bennett and Jim Wolfe, Collinsville, who ran third in the election to name three supervisors.

While the farm woman professed surprise at her election, it came as no surprise to the women's auxiliary of the Caney Valley Soil Conservation District. Mrs. Riney credits the women for her election. "They got out the votes," she said.

She is no novice in soil conservation work. She is serving her second term as State president of the women's auxiliary of the Oklahoma Association of Soil and Water Conservation Dis-

Note:—The author is farm editor for the *Tulsa Daily World*, Tulsa, Okla.

Mrs. Ed Biggerstaff, Mrs. Ray White, and Mrs. A. H. Riney display some of the Soil Stewardship Week posters put out by the Caney Valley Soil Conservation District.

tricts. Before that she was vice president 2 years, helped organize the Caney Valley auxiliary in 1956, and served as president 2 years.

But she has come a long way for a city woman who "had never seen a farm" until 15 years ago and didn't want to move to the farm in the first place.

Her husband, A. H. Riney, was vice president in charge of engineering for a large petroleum company, talked his wife into moving to a 300-acre farm south of Bartlesville with their three daughters in 1944. She "rebelled" for the first 6 months, refused to take an interest in the farm and spent most of her time in the city.

But then she saw "things weren't going right" on the farm with Riney gone much of the time. "I was never the type just to sit. I like to grow things," she said. Her yard in the city had nearly always won first prize.

When her husband offered to buy her 66 baby turkeys, she agreed. She raised 45. The next year she got 800 turkeys.

From then on she grew 1,500 turkeys a year and built a thriving market for her turkeys in Tulsa and Bartlesville. But she still took little interest in the farm.

In 1948, Riney suffered a stroke which left him an invalid. Management of the farm fell to her—but she wasn't prepared to cope with it. The place grew up in weeds. A 1,500-acre bluestem ranch at Ochelata, which she leased out, was badly over-grazed.

The hired man on the farm, when she asked, "Shouldn't you be doing something" always answered, "It's just not time." "I was too dumb to know the difference," she said.

But one day she got in her car and drove south on the backroads. "Every place I found a farmer in the field, I stopped and plied him with questions—how deep was he plowing, what was he planting—why?"

Almost as by an act of providence, she came out on U.S. 75 at the south edge of Washington County. The first sign she saw was "Caney Valley Soil Conservation District welcomes you."

"I'll bet those people will tell me what to do," she said to herself.

The next morning she was camped on the Soil Conservation Service's doorstep at Bartlesville—and "has been camped over there ever since."

She learned for the first time that her husband had a conservation plan on the farm. Charlie Kilpatrick, SCS head, and others helped her establish crop rotations, shift cropland to pasture, stop overgrazing of her grassland. Today, she claims the 1,500-acre Ochelata ranch "has the finest bluestem grass in Oklahoma," because it has been taken care of. She grazes it now with her own 100 Hereford cows.

**The board of supervisors of the Caney Valley Soil Conservation District (left to right): R. J. Bennett, James E. Wolfe, Walter M. Sears, H. Roy Cunningham, and Mrs. A. H. Riney.**

Her husband had been a leader in getting Hulah Dam built while he was head of the agriculture committee of the Bartlesville Chamber of Commerce and had been instrumental in arousing interest in an upstream watershed pilot project on Double Creek before his illness.

She became interested in the Double Creek project. In 1954, it appeared the project might fold because an easement couldn't be secured on a 210-acre farm where the No. 1 damsite was to be built.

The owner wouldn't give the land, but offered to sell. Mrs. Riney took 300 shares of petroleum stock to her banker and told him to sell them so she could buy the farm. She paid $90 an acre for the land and gave the easement for the damsite. The project went on to completion.

"It sure cost me," she said. She didn't need the land—but the project "was good for the community."

That same year Mrs. Riney attended her first national convention of the National Association of Soil Conservation Districts at New Orleans and has been to every one since, except this year.

The only reason she was willing to have her name placed on the ballot as a soil conservation district supervisor "was for the women," she said. "I think it's good to have a woman on the board, to get her point of view. It's a step forward, and I think it will stimulate the women to know that one of them can be elected a supervisor.

"My bridge playing friends think I'm crazy, but I like what I'm doing. Women must establish themselves as leaders; must educate themselves and not wait for the men to ask them.

"Women owe it to themselves to become interested in their business—because they don't know when they will be left with the whole responsibility," she said.

She would like to see the women become more interested in soil conservation district auxiliaries. There are now only 37 active auxiliaries in the state—17 in the northeast section. Caney Valley's auxiliary has 36 active members who meet once a month.

Mrs. Riney manages her farms with the help of a hired farmer, does everything about the farm except drive a tractor. She raises chickens and keeps a big garden. "Digging in the soil is good for me," she said.

She spends a good deal of the time on the road in her soil conservation work, takes care of her invalid husband and still finds time to serve as a "Gray Lady" one day a week at Eastern State Hospital at Vinita. She is active in the Bartlesville Pilot Club and American Cancer Society. She has eight grandchildren.

**LIVING EARTH. By Peter Farb. 178 pp. Illus. 1959. New York: Harper & Bros. $3.75.**

"THE story of the marvelous abundance and complexity of life within the soil beneath us," the dust-jacket says, is the theme of Peter Farb's first book. It is a fascinating story vividly told.

Many conservationists know Farb as the author of lively articles about snow surveys, watershed projects, and other conservation topics in such magazines as *Reader's Digest* and *Coronet*. They will be glad to see his reportorial talents turned upon another subject of such profound importance.

Farb takes his readers right into the subterranean scene and shows them the details of the "soil-scape": the labyrinth of chambers and passages in which the tiny denizens of the dark world live. "The incalcuable numbers of the soil population do not live *in* the soil but rather *between* the soil grains."

He brings us face to face with the curious forms of life that make up the soil community. He expains their bizzare habits and social organizations. Bumblebees, ants, and termites become as real to us as horses, cows, and songbirds in the above-ground landscape. We see such microscopic creatures as nematodes and bacteria, and even the submicroscopic bateriophages, as individuals going about the intricate routines of daily living.

The book is divided into three main parts describing in turn the soil life of forests, grasslands, and deserts. In each division the author introduces the principal characters of the soil biota, always with keen awareness of their interrelationships to one another and to their physical environment.

One cannot read these fascinating stories without wondering a bit about the meaning of it all. Farb gives his answer in two brief final chapters. The big lessons are: (1) the prevalence of "symbiosis" or mutually beneficial partnerships in nature, and (2) the crucial role of the soil in the cycle of life—what the ecologists call the ecosystem.

Living together is more important than living apart, Farb concludes; symbiosis is a more basic law of life than the survival of the fittest. ". . . it is not so important who eats whom—but rather who lives with whom. If there is any secret to survival on the part of the beings underfoot, it may lie in mutual cooperation rather than destruction of other organisms."

The final chapter is a moving statement of the concept of the ecosystem—the interdependence of the living and nonliving. "The soil is the seat of abundance on earth, a massive machinery for keeping the chemical stuff of the planet in constant circulation. There can be no life without soil, and no soil without life—they are inseparable."

Strange as much of the story is, it has the ring of authenticity as a report of things actually seen. If this is not enough, the reader can take confidence from the names of prominent authorities—some in SCS and the Department of Agriculture—with whom the author consulted, and the list of books he used as references.

Superb photographs by Roman Vishniac supply visual images to give the descriptions reality.

"Living Earth" is a first-class nature book with an important conservation message. It will be welcomed both inside and outside the classroom, for it is both instructive and entertaining.

—BEN OSBORN

# *New Homes For Wild Ducks*

By C. F. KEKKO

WILD birds and animals are "taking over" scores of new farm ponds created in Upper Michigan's "Copper Country" in the past 4 years. Nobody minds, though, least of all the farmers who are getting an unexpected bonus from their water storage projects.

A wave of pond construction that began in the fall of 1954, when farmers were hit hard by drought, has resulted in 137 new ponds in the Houghton and Baraga Soil Conservation Districts and Keweenaw County. They are located in the Keweenaw Peninsula, more popularly known as the Copper Country. Though constructed mainly to irrigate strawberries and potatoes and furnish water for livestock, these new water areas are being widely used by a variety of game animals and birds.

Ducks, geese, and white tail deer are most commonly seen, but other game like partridge, rabbits, muskrats, otter, and even bears, have been spotted making use of the ponds.

All these new ponds add up to 70 acres of new water surface plus a lot of good wildlife habitat in the surrounding areas. While this additional water surface was being created, no standing water of any kind was drained by landowners in applying soil and water conservation plans.

The Soil Conservation Service furnishes technical help on ponds for livestock water and irrigation. Cost-sharing through the ACP has provided further incentive.

Ponds, of course, are only one part of a complete soil and water conservation plan for a farm. They are more effective when the proper supporting practices are used on land draining into the pond—practices like adequate cover and fertilizers, sod waterways, diversions, and strip cropping. These conservation measures have proved beneficial to wildlife.

Note:—The author is work unit conservationist, Soil Conservation Service, Hancock, Mich.

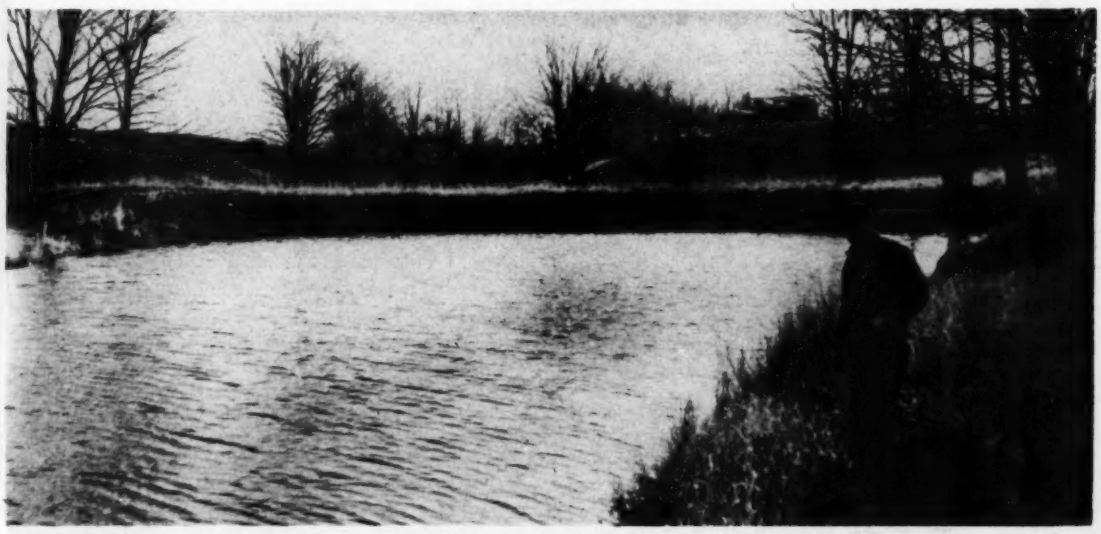
During recent years cooperators in the Houghton and Baraga Soil Conservation Districts have developed about 150 miles of sod waterways, called "grassed ditches" by many of the local farmers. These have been constructed mainly to intercept undergound seepage water which creates a problem on the Munising soil type. This soil type predominates in the Copper Country area. The waterways were also constructed to provide safe disposal of water from sloping land. A lot of this water that used to be lost or that went on to the already flooded main rivers is now stored in farm ponds or reservoirs. The snow melt in the spring is usually rather large (282 inches of snow fell during the winter of 1950 with 150 to 175 inches about the average).

The new water areas, like agricultural lands, are well scattered. In between are wooded areas. In one community called "Paradise", south of Houghton, are some 15 of the ponds. I talked there with Rudy Larson and Cy LaTendresse, cooperators with the soil conservation district. They told me that a flock of ducks spent last summer flying from one pond to another. If something happened to frighten them in one pond, they moved on to another.

Many in this area reported broods of ducks hatched out on their ponds. Ray Jarvi, strawberry grower in Keweenaw Bay, reported two broods hatched out on his large pond last summer.

New muskrat pile that appeared on a pond soon after construction on the Oscar Walker farm near Chassell, Mich.

In the Calumet Golf Course area, Hjalmer Olson and his neighbors, the Harma brothers, William Hammary, and Emil Tossava, all report ducks and geese flying back and forth between their ponds last summer. Hjalmer's comment: "I can't figure what they found to eat



Strawberry irrigation pond owned by Bill Neimela, Dollar Bay, Mich., that harbored ducks and geese during 1958.

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from the bottom of the pond, but it sure made them grow and they were fat. We found out this fall." Hjalmer and his son managed to harvest a few ducks during the recent hunting season.

On the Skanee road, out of L'Anse, is the former Henry Ford farm. Ford owned a sawmill in L'Anse and used the farm for his various experiments. Now owned by Carlo and Harold Heikkinen, the farm contains 740 acres, almost entirely surrounded by woods.

The clearing used for beef cattle and strawberry production is a paradise for game. Deer drink regularly from two farm ponds and the pond edges are full of deer tracks. Being able to get water here saves them a 3-mile trip down to the Silver River below. Carlo Heikkinen, member of the Baraga SCD board stated, "The ponds have already paid for themselves by the habitat they have provided for deer, ducks, and other wildlife."

Ray Jarvi, Keweenaw Bay, Mich. points to where two broods of ducks hatched out near his pond in 1958.

On the Oscar Walker farm in Worham, muskrat piles appeared soon after the pond filled with water. This also has been true of a number of others. Ed Peters of Chassell has an irrigation pond located in the woods about 500 feet from the edge of his strawberry fields. "I hardly ever walk to the pond that I don't see some game near it," he said, "especially deer and rabbits; twice I have seen a bear." Ducks too have used the pond.

Fish are becoming plentiful too. Several of the spring-fed ponds have been planted to trout while others are used to supply bait fish for sportsmen. For some, the bait fish business is becoming a profitable sideline.

Although the primary reason for construction was irrigation and livestock water, the wildfowl and animals have shown that they appreciate this "extra" water. All of the ponds in the Copper Country are relatively new. As more of the grass and shrub cover grows up around them, it is expected that even more wildlife will find them useful. Judging from present interest, it is almost certain that the number of ponds will double during the next 4 years. This should add another 70 acres of new water surface widely dispersed throughout the area and step-up the population of game animals.

All in all, farm ponds have created a lot of interest in the Copper Country. Townspeople as well as farmers are watching to see what effect the ponds will have in their future hunting and recreation plans.